

ACHARYA NARENDRA DEV COLLEGE (University Of Delhi)

ELITE PROJECT

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Mentor

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A Study of the Fluctuations in the Stock Market

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ABSTRACT

In this project, we study the fluctuations in the stock market. We have observed the ups and downs in share market and its effect on the economy of a country. We found that the fluctuations are too caused by changes in GDP and currency-Dollar parity.

INTRODUCTION

Good economic outlooks mean–

- People feel confident and spend more money, boosting company profits and positive economic outlook. The reverse is also true.
- The stock market is a realible form of investment. Investing in the stock market has an overriding goal to make money. Change within the stock market can have wide reaching effects.

- When analyst use the term "stock market fluctuations", this means changes in price.
- The stock market is a real market where buyers and sellers meet to trade shares for money and the rules of supply and demand drive prices up and down, is called fluctuations. The actions of every individual investor cause the stock market to fluctuate.

Contents

- Stock Market
- Factors affecting the stock ma
- Reasons for fluctuations in the stock market
- Stock Market Index (SMI)
- Formula for calculating SMI
- Gross Domestic Product (GDP)

- Formula for calculating GDP
- Rupee/Dollar
- Methodology
- Data
 - a. Indian Market
 - b. USA Market
 - c. Singapore Market
 - d. Japan Market

- Correlation
- Multiple Correlation
- Regression Models-
 - a. Indian Regression Model
 - b. USA Regression Model
 - c. Singapore Regression Model
 - d. Japan Regression Model
- Conclusion
- Bibliography

STOCK MARKET

A Stock market of India was set up in 1875. At that time there were 22 bookies who met and established the **BOMBAY STOCK EXCHANGE**.

A stock market is a public market for the trading of company stocks and derivatives at an agreed price. The stock market is a realible form of investment. The stocks are traded at a place called exchange.

Objective

- To identify and analyse the impact of sentiments of investors on the share market prices and returns.
- To show the growth of a company (i.e. Profits and loss of company in the particular year).

In order to identify and understand the fluctuations in the stock market, one has to get a complete idea about the operations in the market. Every decision of the investor has an impact, which leads to profit or loss to him.

FACTORS AFFECTING THE STOCK MARKET

- ♦ **DEMAND and SUPPLY-** One of the major factor affecting stock price is demand and supply. The trend of the stock market trading directly affects the price. When people are buying the particular stocks, the price of that stock increases and vice -versa.
- ♦ **INTEREST RATES-** Regional and country economic factors, such as

Tax and interest rate policy, contribute to the directional change in the market.

- ♦ **INFLATION-** Changes in inflation trends influence the long term stock market trends and volatility.
- ♦ **VOLATILITY-** The stock market is volatile place to invest money. There is a strong relationship between volatility and market performance. When volatility increases stock market falls and vice- versa.

- **INVESTOR BEHAVIOUR-** The higher level of volatility that comes has a direct impact on portfolios. As an investors portfolio of stock declines they should rebalance the weighting between stocks and bonds by buying more stocks at a lower price.
- **FOREIGN MARKETS-** If the foreign market is facing the recession period, then the exporters can not sell goods overseas as they used to.

This causes drop in revenue and that can show up a fluctuation in the market.

- **ECONOMIC GROWTH-** High economic growth/ better prospectus for growth will help firms be more profitable because there will be more demands for goods and services. This will help in boosting up company's dividends and share prices.

- **BANDWAGON EFFECT-** At times the stock market seems to over react to certain events. Ex.- In 1987, relatively little bad news caused the stock market to fall by 25%, but soon it regained the loss. Whenever prices fall people may feel insecure and want to get out of the market.

REASONS FOR THE FLUCTUATION IN STOCK MARKET

The following reasons are responsible for the fluctuations in the stock market:

- Imbalance between demand and supply conditions
- Insider-trading reports
- Market timing
- New releases about the firms earnings and other important financial details

STOCK MARKET INDEX

A stock market index or stock index is a method of measuring the value of a section of the stock market. This is computed from the prices of selected stocks. It is a tool used by investors and financial managers to describe the market and to compare the returns on the specific investments.

FORMULA FOR CALCULATING STOCK MARKET INDEX

Share market indices can be calculated by using a Laspeyres formula:-

$$I (\text{index}) = M(t) / B(t)$$

$M(t)$ =market capitalisation at time t

$B(t)$ =adjusted base date market capitalisation of the index at that time (t) , or

$I = (\text{Current market value} * \text{base point}) / \text{Base market value}$

So the easiest formula for calculating stock index is given as :

$$I(\text{Index value}) = \frac{\text{Market value}}{\text{Divisor}}$$

Divisor= re-based index values

Base Market value= reflects the amount of capital that all companies had at the time the index was started. It depends on variation of index.

Gross Domestic Product (GDP)

Gross Domestic Product (GDP) is the market value of all officially recognised financial goods and services produced within a country in a given period of time.

GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of products. It is often used as an indicator of standard of living of a country.

FORMULA FOR CALCULATING GDP OF A COUNTRY

GDP can be determined in three ways ,all of which should be in principle, give the same result. These are the product approach, the income approach and the expenditure approach.

- **The Product Approach-** It sums the output of every class of enterprise, to arrive at the total. This method consists of two stages:

(1) $\text{Net value added} = \text{Gross value of output} - \text{Value of intermediate consumption}$

(2) $\text{Value of output} = \text{Value of total sales of goods and}$

Services+ Value of changes in the inventories

- ♦ **Income Approach**– It is sum total of income of an individual living in a country during 1 year. Formula is given by:

$$\text{GDP} = \text{Compensation of employees} + \text{Gross operating surplus} + \text{Gross mixed income} + \text{Taxes} - \text{Subsidies on production and imports}$$

i.e.
$$\text{GDP} = \text{COE} + \text{GOS} + \text{GMI} + \text{T} - \text{S}$$

- ♦ **Expenditure Approach**– It is the sum total of all the expenditure incurred by individuals during one year. Formula is given as:

$$\text{GDP} = \text{Private consumption} + \text{Gross investment} +$$

Government spending+ (Exports- Imports)

i.e. $GDP = C + I + G + (X - M)$

Among the three defined above the most direct is product approach, which sums the output of every class of enterprise to arrive at the total. The expenditure approach works on the principle that all of the products must be bought by somebody, therefore the total value of product must be equal to people's total expenditure in buying things. The income approach works on the principle that the income of the productive factors must be equal to the value of their product and determines GDP by finding the sum of all producer's income.

Rupee/Dollar

What is Rupee?

The rupee is the common name for the currency in countries like India, Pakistan, Bangladesh, etc. The first currency "rupee" was introduced in 16th century by Sher Shah Suri. It is derived from sanskrit word 'rupya' meaning, wrought silver, a coin of silver.

What is Dollar?

The dollar is the basic monetary unit of US, Canada, Australia and the certain countries in the Pacific, Caribbean, SE Asia, Africa and South America.

But the currency exchange rate in the stock market is calculated with respect to US-Dollar.

Methodology

- Stock Market is affected by various factors but in this project we have only considered GDP of a country, Stock Index and the exchange rate of the currency.
- The main purpose of this project is to check the correlation between GDP of a country, Stock Index and the exchange rate of the currency.
- For this we took the Stock Indices, GDP and exchange rate of the currency of four countries namely India , USA, Japan and Singapore and calculated correlation between them.

Later we found their multi-correlation coefficient and based on the result we developed Regression Coefficient Model.

Data(Indian Stock Market)

Year	SI	GDP	RR
2003	5.83896	25528.61	46.6
2004	6.60269	31224.4	45.2
2005	9.39793	35579.08	44.01
2006	13.78691	41205.44	45.17
2007	20.28699	47979.11	41.20
2008	9.64731	55530.87	43.41
2009	17.46481	60958.99	48.32

2010	20.50909	74332.75	45.65
2011	15.45492	87002.42	46.61
2012	19.42671	97513.96	53.34

Here the Stock Index figures are taken in two digits.

Data (of USA)

Year	GDP (in billions)	Stock Index	US Dollar
2003	11836.43	1595.91	91.62
2004	12246.93	1986.74	87.72
2005	12622.95	2075.73	84.61
2006	12958.48	2219.41	80.52
2007	13206.38	2613.92	79.04
2008	13161.93	2522.66	70.69

2009	12757.95	1774.33	76.21
2010	13062.98	2257.04	79.12
2011	13299.10	2796.86	69.51
2012	13593.20	2747.48	75.62

Data (of Singapore)

Year	GDP (in billions)	Stock Index (FTSE- 100)	Singapore dollar
2003	178.119	4113.00	1.74
2004	194.433	4393.20	1.69
2005	208.764	5242.40	1.66
2006	226.765	5896.90	1.59
2007	247.218	6630.90	1.51

2008	251. 539	5406. 80	1. 41
2009	249. 56	4127. 20	1. 45
2010	286. 447	5132. 90	1. 36
2011	301. 228	5868. 96	1. 26
2012	305. 202	5260. 19	1. 25

Data of Japan

Year	GDP (in billions)	SI (NIKKEI 225)	Yen Rate (JPY/USD)
2003	485968.30	8424.51	115.92
2004	49744.80	11309.57	108.16
2005	503921.00	11192.33	110.14
2006	512452.00	15789.31	116.35
2007	523685.80	17958.88	117.76

2008	518230.90	14338.54	103.38
2009	489588.40	9522.50	93.60
2010	512364.60	9762.98	87.75
2011	509450.10	9521.94	79.71
2012	519621.00	8440.25	79.76

Correlation

Correlation between the stock index , GDP and the currency exchange rate of the above markets have been calculated for finding out the more better picture of working and trading of stocks in International market. Considering the case of Indian market —

- Correlation coefficient between SI and GDP= 0.71029
- Correlation coefficient between SI and RR = 0.23601
- Correlation coefficient between GDP and RR=0.59608

(R-Rupee)

USA(NASDAQ)

Correlation coefficient between

- SI and GDP= 0.89529
- SI and USD = -0.74928
- GDP and USD=-0.85286(USD-US-Dollar)

Singapore Stock Exchange

Correlation coefficient between

- SI and GDP = 0.42638
- SI and SD = -0.35697
- GDP and SD = -0.98706 (SD-Singapore Dollar)

Japan Stock Exchange

Correlation coefficient between

- SI and GDP = 0.08210
- SI and YenRate = 0.62003
- GDP and Yen Rate = -0.17228

Multiple Correlation

Multiple correlation coefficient(between stock index and GDP and Currency rate) of India= 0.55898

Multiple correlation coefficient of USA= 0.80230

Multiple Correlation coefficient of Singapore= 0.34062

Multiple Correlation coefficient of Japan= 0.42122

The above values shows that the Stock Index and GDP and Currency rate of all above markets are multi-correlated.

Therefore ,their regression model-

$$X_1 = a + b X_2 + c X_3$$

where X_1 is SI, X_2 is GDP and X_3 is Currency Rate

$$a = \overline{X_1} + (w_{12} \sigma_1 / w_{11} \sigma_2) \overline{X_2} + (w_{13} \sigma_1 / w_{11} \sigma_3) \overline{X_3}$$

$$, \overline{X_1} = \text{mean } X_1, \overline{X_2} = \text{mean } X_2, \overline{X_3} = \text{mean } X_3,$$

$$b = -w_{12} \sigma_1 / w_{11} \sigma_2, c = -w_{13} \sigma_1 / w_{11} \sigma_3$$

$w_{11}=1 - (\text{correlation coefficient between GDP and CR})^2$

w_{12} = correlation coefficient between SI and CR* correlation coefficient between GDP and CR- correlation coefficient between SI and GDP.

w_{13} =correlation coefficient between SI and GDP* correlation coefficient between GDP and CR- correlation coefficient between SI and CR.

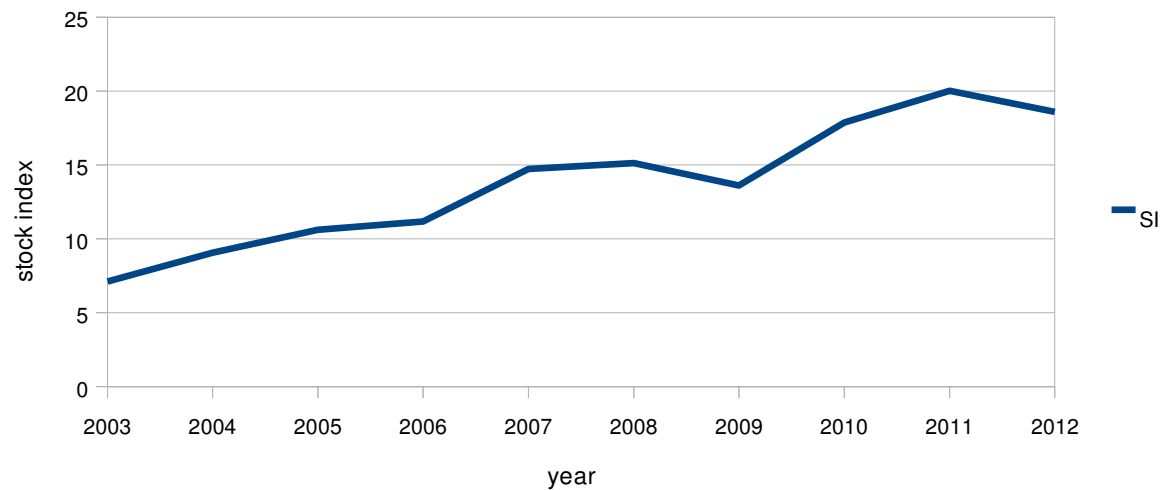
σ_1 = standard deviation of X_1 .

σ_2 = standard deviation of X_2 .

σ_3 = standard deviation of X_3 .

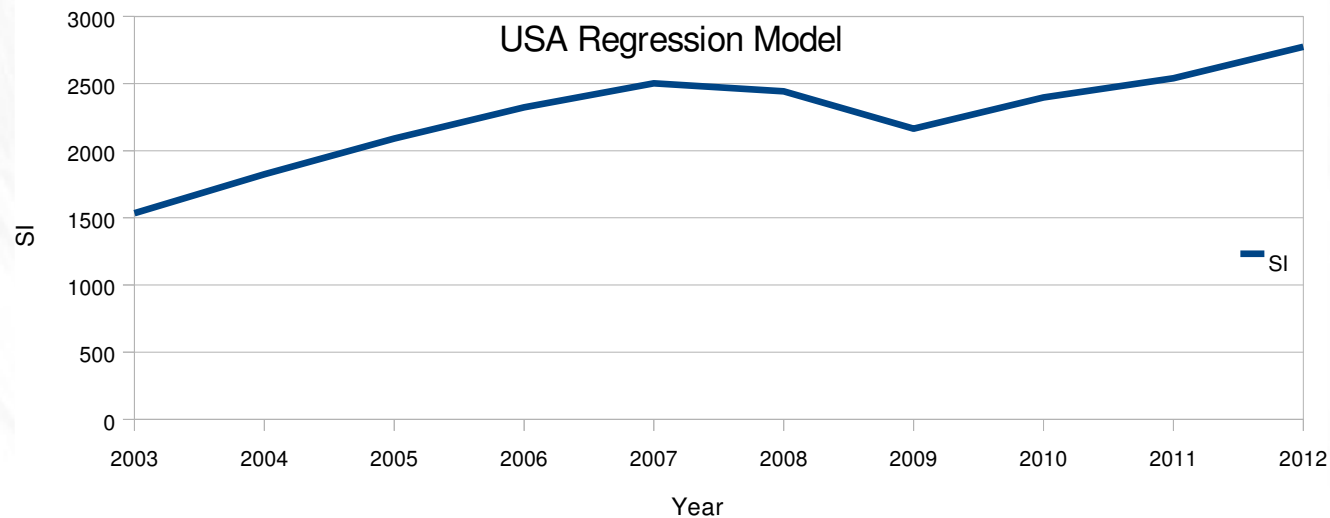
Regression Model

- Indian model- $X_1 = 26.87932 + 0.00021 X_2 - 0.53932 X_3$
Indian Regression Model



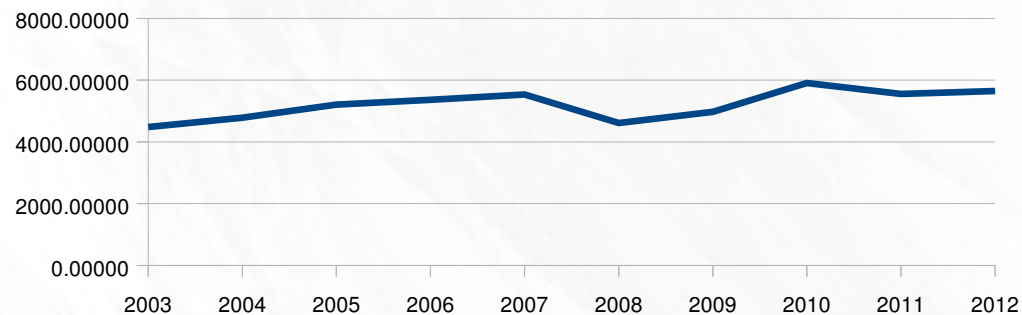
USA Regression Model

$$X_1 = -7416.76954 + 0.73273 X_2 + 3.04762 X_3$$



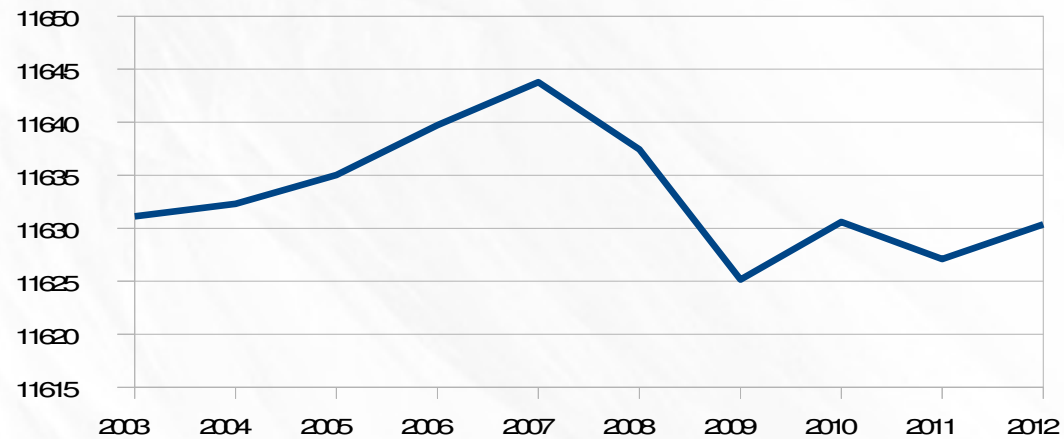
Singapore Regression Model

$$X_1 = -25245.05456 + 53.7862 X_2 + 11580.8745 X_3$$



Japan Regression Model

$$X_1 = 11438.69414 + 0.00032 X_2 + 0.31838 X_3$$



Conclusion

The Regression model-

$$X_1 = a + b X_2 + c X_3$$

where X_1 is SI, X_2 is GDP and X_3 is Currency Rate

Coming year Stock Index can be predicted using the estimated GDP and estimated fluctuation in currency exchange rate of the coming year.

Bibliography

Text books:-

Roy E. Bailey , "The Economics of Financial Markets",Cambridge University Press,2005

S.C Gupta and V.K. Kapoor , "Fundamentals of Mathematical Statistics",Sultan Chand and Sons,1970

Magzines and Newspaper:-

Business Today

Economic Times

Websites:-

www.economywatch.com

www.forecast-chart.com

www.finance.yahoo.co.in

www.nasdaq.com

www.bseindia.com